MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

PTG 0116 – TRIGONOMETRY AND COORDINATE GEOMETRY

(All sections / Groups)

7 MARCH 2018
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 pages with 4 questions and an appendix.
2. Answer all questions.
3. Unless stated otherwise, if an answer is given as a decimal, it should be rounded to **four** significant figures.
4. Write your answers in the Answer Booklet provided.
5. Show all workings.

Question 1

(a) If given $\sin\theta = -\frac{\sqrt{5}}{3}$ and $\cos\theta > 0$, find $\cot\theta$ and $\sec\theta$. Simplify your final answer [5 marks]

(b) Without using the calculator, find the exact value of $\cos^{-1}\left[\sin\left(\frac{7\pi}{6}\right)\right]$. [3 marks]

(c) Solve the trigonometric equation $\cos 2x = \sqrt{2} - \cos 2x$ for $0 \le \theta < 2\pi$. [8 marks]

(d) Solve the triangle in **Figure 1** below. Then, calculate the area of the triangle. Leave your answer to 2 decimal places.

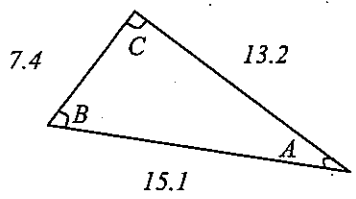

Figure 1

[9 marks]

Question 2

(a) Write the following in polar form:

i. $(\sqrt{3},1)$ [4 marks]

ii. $7.93 - 8.13i$ [5 marks]

(b) Using De Moivre's theorem, find z^4 if given $z = \frac{8\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)}{3\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)}$. Leave the final answer in $a + bi$. [7 marks]

Continued...

(c) Given $\mathbf{u} = 7\mathbf{i} + 5\mathbf{j} - \mathbf{k}$ and $\mathbf{v} = -6\mathbf{i} - 7\mathbf{j} + 2\mathbf{k}$. Find:

i. $\mathbf{u} \cdot \mathbf{v}$. [2 marks]

ii. $\mathbf{u} \times \mathbf{v}$. [4 marks]

iii. angle between vector $\mathbf{u}$ and $\mathbf{v}$. [3 marks]

Question 3

(a) A diameter of a circle has the endpoints of $A = (-1,-6)$ and $B = (7,11)$. Find:

i. the radius and the center of the circle. [5 marks]

ii. the equation of straight line CD that is perpendicular to AB and passes through the center of the circle. [5 marks]

iii. the equation of straight line EF that is parallel to AB and passes through the center. [3 marks]

(b) Given the equation of an ellipse is $\frac{(x-1)^2}{4} + \frac{(y-2)^2}{9} = 1$.

i. Find the coordinates of the center, foci and vertices of the ellipse. [8 marks]

ii. Sketch the ellipse and label the center, foci and vertices. [4 marks]

Continued...

Question 4

(a) Given that $A=\begin{bmatrix}4 & 1\\ 6 & 8\\ 3 & -4\end{bmatrix}$ and $B=\begin{bmatrix}2 & 3\\ 6 & -7\\ -1 & -1\end{bmatrix}$ and $C=\begin{bmatrix}4 & 2 & 3\end{bmatrix}$. Find:

i. $\frac{1}{2}A+3B$. [4 marks]

ii. $A\cdot B^T$. [4 marks]

iii. $\left(A\cdot B^T\right)\cdot C^T$ [2 marks]

(b) Solve the following using Cramer's rule.

$$2x+3y-z=2$$
$$6y+7z=8$$
$$-9x-z=-7$$

[15 marks]

End of Paper

APPENDIX

Trigonometric identities and formulas

$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$

$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B \qquad \cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \cos^2 A - \sin^2 A$

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B \quad \ldots \quad \sin 2A = 2 \sin A \cos A$

$\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \quad \ldots\ldots \quad \tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$

$2 \cos A \cos B = \cos(A + B) + \cos(A - B)$

$2 \sin A \sin B = \cos(A - B) - \cos(A + B)$

$\sin A + \sin B = 2 \sin \dfrac{A+B}{2} \cos \dfrac{A-B}{2} \quad \ldots\ldots \quad \sin A - \sin B = 2 \cos \dfrac{A+B}{2} \sin \dfrac{A-B}{2}$

$\cos A + \cos B = 2 \cos \dfrac{A+B}{2} \cos \dfrac{A-B}{2} \qquad \cos A - \cos B = -2 \sin \dfrac{A+B}{2} \sin \dfrac{A-B}{2}$

$\sin^2 \dfrac{A}{2} = \dfrac{1 - \cos A}{2} \qquad \cos^2 \dfrac{A}{2} = \dfrac{1 + \cos A}{2} \qquad \tan^2 \dfrac{A}{2} = \dfrac{1 - \cos A}{1 + \cos A}$

$\sin \dfrac{A}{2} = \pm \sqrt{\dfrac{1 - \cos A}{2}} \qquad \cos \dfrac{A}{2} = \pm \sqrt{\dfrac{1 + \cos A}{2}} \qquad \tan \dfrac{A}{2} = \pm \sqrt{\dfrac{1 - \cos A}{1 + \cos A}} = \dfrac{1 - \cos A}{\sin A} = \dfrac{\sin A}{1 + \cos A}$